

## CLAIMS

1. A fuel cell bipolar plate comprising, in combination:

a first plate having a first surface, an opposing second surface, and a plurality of ribs defining anode flow channels on the first surface of the first plate;

5 a second plate having a first surface, an opposing second surface, and a plurality of ribs defining cathode flow channels on the second surface of the first plate, the second plate nested with the first plate so as to define a plurality of center flow channels extending between the first and second plates;

10 a first edge area at one end of the first and second plates and a second edge area at an opposed end of the first and second plates;

a plurality of first internal fuel manifolds formed in the first edge area and in fluid communication with the center flow channels;

a plurality of second internal fuel manifolds formed in the first edge area and in fluid communication with the anode flow channels, and;

15 a turnaround plenum formed in the second edge area, the turnaround plenum in fluid communication with the center flow channels and the anode flow channels.

2. The bipolar plate of claim 1, further comprising a catalyst on the first surface of the second plate within the center flow channels.

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3. The bipolar plate of claim 1, further comprising an aperture formed in the second seal area and fluidly connecting the turnaround plenum with the anode flow channels.

4. The bipolar plate of claim 1, wherein a portion of the second end area is folded over  
25 onto itself, and a spacer is positioned within the folded over portion.

5. The bipolar plate of claim 1, wherein the bipolar plate is comprised of a plurality of segments, each segment having a first internal fuel manifold and a second internal fuel manifold.
- 5 6. The bipolar plate of claim 5, wherein centers of the first and second internal fuel manifolds of each segment are on a line that extends substantially parallel to a flow path of the bipolar plate.
7. The bipolar plate of claim 1, further comprising a plurality of flat wires positioned on  
10 the first surface of the first sheet.
8. The bipolar plate of claim 7, further comprising an electrode positioned on the flat wires.
- 15 9. A fuel cell bipolar plate comprising, in combination:  
a plate formed of a first plate and a second plate and comprising plurality of segments, the first plate having a first surface, an opposing second surface, and a plurality of ribs defining anode flow channels on the first surface of the first plate, the second plate having a first surface, an opposing second surface, and a plurality of ribs defining cathode flow  
20 channels on the second surface of the first plate, the second plate nested with the first plate so as to define a plurality of center flow channels extending between the first and second plates;  
a first edge area at one end of the first and second plates and a second edge area at an opposed end of the first and second plates;  
a first internal fuel manifold formed in the first edge area of each segment and in fluid  
25 communication with the center flow channels;  
a second internal fuel manifold formed in the first edge area of each segment and in fluid communication with the anode flow channels, and;  
a turnaround plenum formed in the second edge area, the turnaround plenum in fluid communication with the center flow channels and the anode flow channels.

10. The bipolar plate of claim 9, further comprising a catalyst on the first surface of the second plate within the center flow channels.
11. The bipolar plate of claim 9, further comprising an aperture formed in the second seal  
5 area and fluidly connecting the turnaround plenum with the anode flow channels.
12. The bipolar plate of claim 9, wherein a portion of the second end area is folded over onto itself, and a spacer is positioned within the folded over portion.
- 10 13. The bipolar plate of claim 9, wherein centers of the first and second internal fuel manifolds of each segment are on a line that extends substantially parallel to a flow path of the bipolar plate.
14. The bipolar plate of claim 9, further comprising a plurality of flat wires positioned on  
15 the first surface of the first sheet.
15. The bipolar plate of claim 14, further comprising an electrode positioned on the flat wires.